

PCT/EP03/05538
Carbon Application

HPJ/RC/m
03 March 2004

Claims:

1. A ceramic filter for molten metal filtration comprising a ceramic powder and fibers bonded by a network of graphitized carbon.
2. The filter of claim 1, wherein the ceramic powder contains or in particular consists of zirconia, silica, alumina, brown fused alumina, magnesia, any type of clay, talcum, mica, silicon, carbide, silicon-nitride and the like or a mixture thereof, or graphite.
3. The filter of claim 1 or 2, wherein the graphitized carbon constitutes up to 15 % by weight, in particular up to 10 % by weight, more specifically 5% by weight.
4. A filter for molten metal filtration comprising fibers bonded by a network of graphitized carbon.
5. The filter of any of claims 1 to 4, wherein the fibers are selected from the group consisting of ceramic fibers, glass fibers, organic fibers, carbon fibers, metal fibers and mixtures thereof.
6. The filter of claim 5, wherein the ceramic fibers are selected from the group of alumina fibers, silica fibers, aluminosilicate fibers and mixtures thereof.
7. The filter of claim 5, wherein the organic fibers are selected from the group of polyester fibers, polyacrylonitrile fibers, polyethylene fibers, polyamide fibers, viscose fibers, aramid fibers, and mixtures thereof.
8. The filter of anyone of claims 1 to 7, characterized in that it contains an amount of 0,1 to 20, in particular 1 to 10 % by weight of said fibers.

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9. The filter of anyone of claims 1 to 6, characterized in that the length of the fibers is in the range of 0.1 mm to 5 mm.

10. A method to produce filters for molten metal filtration comprising fibers and a bonded network of graphitized carbon, comprising the steps

a) impregnating a foam made of thermoplastic material with a slurry containing fibers, a graphitizable carbon bonding precursor and optionally other additives,

b) drying, optionally followed by one or two coatings of the same slurry in order to increase the mass, followed by final drying,

c) firing the impregnated foam in non-oxidizing and/or reducing atmosphere at a temperature in the range of from 500 to 1000 °C, in particular from 600 °C to 700 °C,

whereby the carbon bonding precursor is converted at least partially or fully to a bonded network of graphitized carbon and organic fibers undergo a pyrolysis.

11. A method to produce ceramic filters according to anyone of claims 1 to 3 and 5 to 9, comprising the steps

a) impregnating a foam made of thermoplastic material with a slurry containing fibers, ceramic powder and a graphitizable carbon bonding precursor, and optionally other additives,

b) drying, optionally followed by one or two coatings of the same slurry in order to increase the mass, followed by final drying,

c) firing the impregnated foam in non-oxidizing and/or reducing atmosphere at a temperature in the range of from 500 to 1000 °C, in particular from 600 °C to 700 °C,

whereby the carbon bonding precursor is converted at least partially or fully to a bonded network of graphitized carbon and organic fibers undergo a pyrolysis.

12. The method of claim 10 or 11 utilizing a thermoplastic foam that contains polyurethane.

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13. The method of claim 12, wherein the carbon bonded precursor is mixed with fibers, water, organic binder and additives to control the rheology, prior to impregnating the foam.

14. A method to produce the ceramic filters according to anyone of claims 1 to 3 and 5 to 8, comprising the steps

- a) pressing a semi-damp mixture comprising, fibers, ceramic powder and a graphitizable bonding precursor and optionally other additives in a hydraulic press,
- b) pressing to obtain a perforated article in the shape of a disk or a block,
- c) firing the perforated article in non-oxidizing and/or reducing atmosphere at a temperature in the range of from 500 °C to 1000 °C, in particular from 600 °C to 700 °C,

whereby the carbon bonding precursor is converted partially or fully to a bonded network of graphitized carbon.

15. A method for producing filters for molten metal filtration comprising fibers and a bonded network of graphitized carbon, comprising the steps

- a) pressing a semi-damp mixture comprising, fibers and a graphitizable bonding precursor and optionally other additives in a hydraulic press,
- b) pressing to obtain a perforated article in the shape of a disk or a block,
- c) firing the perforated article in non-oxidizing and/or reducing atmosphere at a temperature in the range of from 500 °C to 1000 °C, in particular from 600 °C to 700 °C,

whereby the carbon bonding precursor is converted partially or fully to a bonded network of graphitized carbon.

16. The method of any one of claims 10 to 15 wherein high melting pitch (HMP) is used as the graphitizable carbon bonding precursor.

17. The method of any one of claims **10** to **16** wherein a slurry or semi-damp mixture is used comprising:

fibers in the range of 0,1 to 20 parts by weight,

graphitizable carbon bonding precursor in the range of from 2 to 15 parts by weight,

ceramic powder in the range of from 0 to 95 parts by weight,

anti-oxidation material in the range of from 0 to 80 part by weight,

graphite in the range of from 0 to 90 parts by weight,

organic binder in the range of from 0 to 10, in particular 0.2 to 2 parts by weight and,

dispersion agent in the range of from 0 to 4, in particular 0.1 to 2 parts by weight.

18. The method of claim **17** wherein metallic powders such as steel, iron, bronze, silicon, magnesium, aluminium, boron, zirconium boride, calcium boride, titanium boride and the like, and/or glass frits containing 20 to 30 weight percent or boric oxide are used as the antioxidation material.

19. The method of claim **17** or **18** wherein a green binder such as PVA, starch, gums, sugar or the like or a combination thereof is used as the organic binder.

20. The method of any one of claims **17** to **19** wherein ligninsulphonate is used as the dispersion agent.

21. The method of any one of claims **17** to **20** wherein a slurry or semi-damp mixture is used that further comprises:

a plasticizer such as polyethylene glycol (molecular weight: 500 to 10000) in the range of from 0 to 2 parts by weight,

an anti-foam agent such as silicon anti-foam in the range of from 0 to 1 part by weight.